



Australian Bureau of Statistics

1350.0 - Australian Economic Indicators, 1991

ARCHIVED ISSUE Released at 11:30 AM (CANBERRA TIME) 30/11/1991

INTRODUCTION

The rate of inflation is an important macroeconomic variable and is regarded as an important indicator of the economic health of the nation. However there is no unique measure of inflation. The ABS produces a number of broadbased price indexes, which vary in both their coverage and conceptual basis. The best known and most commonly used measure of general price change in the economy is the Consumer Price Index (CPI). Others include the implicit price deflators (IPDs) and fixed weighted indexes (FWIs) published with the annual and quarterly national accounts. These indexes have certain advantages over the CPI for some analyses because they provide an interrelated and consistent set of measures of price change for individual national accounts expenditure categories and, at their broadest level, for the whole economy.

This paper briefly describes and compares the CPI and the national accountsbased measures of price change.

THE CONCEPTUAL BASIS OF PRICE INDEXES

The compilation of price indexes involves aggregating price changes relating to many different classes of goods and services. The various component price changes have to be weighted together according to their relative importance. Indexes published by the ABS are generally fixed weighted, although IPDs are current weighted price indexes.

Fixed weighted price indexes, as their name implies, combine the various component price changes using weights which do not change. These weights are based on the relative importance in a particular base period, of expenditures on the various classes of goods and services which are in the scope of a particular price index. The weights remain fixed for the life of the index. Adjustments are made so that changes in costs resulting from changes in quality are not reflected in the price of items. Such indexes measure the change in the cost of purchasing an *identical* basket of goods and services from one period to another. They therefore reflect "pure" price change.

Changes in the weights are made periodically to take account of any changes in expenditure patterns. Indexes relating to different base periods can be linked together to provide a continuous time series, although they will not measure pure price change precisely between periods spanning a link. The CPI and national accountsbased fixed weighted indexes are of this type.

Current weighted price indexes, on the other hand, combine the various component price changes using expenditure information for each period. Differences in index numbers may reflect both price and quantity changes. This feature can be an advantage for certain types of analyses. For example, in analyses of export and import prices, where significant compositional change can occur over time, it may be desirable to take account of prices actually received or paid on current period activity, rather than prices based on the fixed activity weights of a previous period. The national accountsbased IPDs are current weighted indexes.

THE CONSUMER PRICE INDEX (CPI)

The CPI measures the change over time in the price of a basket of goods and services which account for a high proportion of expenditures by employee households in metropolitan areas. Employee households (for the purposes of the CPI) are defined as those households which obtain at least three quarters of their total income from wages and salaries but excluding the top ten per cent (in terms of income). Some significant Australian population sub groups are therefore excluded from the CPI population group. These include pensioners and other retired people, the unemployed, full time students living independently, the self employed and people of independent means, high income earners, and people living outside the eight capital cities.

The CPI basket of goods and services covers 107 expenditure classes arranged in the following groups: food; clothing; housing; household equipment and operation; transportation; tobacco and alcohol; health and personal care; and recreation and education.

The weights applied to these expenditure classes are based on a survey of household expenditure. Changes in weighting are made at approximately five year intervals to take account of changes in household spending patterns. When the expenditure weights are updated, the new index is linked to the previous one. The linking factor is the ratio, in the link period, between two sets of aggregates derived from weighting patterns based respectively on the old and new baskets. In a linked series, price movements are measured on the basis of one weighting pattern up to the time of the link and on another weighting pattern after the link. This ensures that the introduction of new weights does not, of itself, raise or lower the level of the index. The CPI now comprises eleven series of price indexes which have been linked together to form a continuous series.

The CPI aims to measure the change in the cost of purchasing an **identical** basket of goods from one quarter to the next and therefore **is adjusted to exclude the effects of any change in the quality or quantity of the goods or services**. In compiling the CPI, a considerable amount of effort is put into making adjustments for changes in quality. It measures changes in prices paid rather than nominal or recommended prices. In some items, such as cars and petrol, there can be substantial differences between list prices and prices actually paid.

There is no CPI for Australia as such. For general statistical purposes the equivalent of an all-Australia index is the weighted average of the indexes for the eight capital cities. The weights reflect the relative number of CPI population group households in each capital city.

The CPI is available in original terms only. Some analysts have attempted to modify the CPI to mitigate the effects of perceived seasonal or irregular components in the series in order to reveal a so called underlying rate of price change. For example, meat, fruit and vegetable, clothing and petrol prices, are often excluded. However in an analysis published in the February 1991 edition of **Australian Economic Indicators**, it was concluded that any net seasonality that may have existed has been fading over the years and is not strong in the CPI at the "all groups" level. In addition, irregularity in the series has generally tended to be small, although by its nature, irregularity could change at any time. Trend behaviour generally determines most of the CPI movements (see "**Is The Consumer Price Index Seasonal?**" by John Zarb, **Australian Economy Indicators**, February 1991).

Care must be exercised in using the CPI because its coverage is restricted :to expenditures of householders (it excludes price changes in capital goods for instance), and its scope is limited to employee households in the capital cities.

IMPLICIT PRICE DEFATORS (IPDs)

Many national accounts aggregates are expressed in both current and constant price terms. Constant price series have the direct effect of price changes removed and are often referred to as "real" estimates. A wide range of price indexes and quantity information is used to convert current price national accounting expenditure aggregates to constant prices. Price indexes used include the CPI, producer price indexes, import and export price indexes, award rates of pay indexes and various nonABS price indexes. An IPD is created by dividing a current price value by its corresponding constant price value. IPDs are derived measures of price change (hence the term implicit), rather than direct measures, and are equivalent to a **current weighted** price index.

IPDs are published on a quarterly or annual basis for all items of expenditure shown in the domestic production account of the Australian national accounts except for increase in stocks, where the IPDs are not particularly meaningful because of the mix of positive (stock build up) and negative (stock rundown) changes which occur in this item. When derived from the major national accounting aggregates, such as gross national expenditure, IPDs relate to a far wider range of goods in the economy than does the CPI. The coverage of the CPI is broadly equivalent to, but not the same as, the IPD for private final consumption expenditure (see below).

As they are current weighted indexes, IPDs do not measure "pure" price change. However they can be selected in such a way as to lessen the potential impact of compositional change.

In practice, much of the quarterly change in the physical composition of national accounting aggregates is seasonal. Therefore an IPD calculated from seasonally adjusted data is normally a more reliable indicator of "pure" price change than one calculated from original data. The quarterly IPDs published with the national accounts are derived from seasonally adjusted data. .

Increase in stocks is subject to extreme compositional change (in particular individual commodities may have positive and negative values in consecutive periods). Therefore, the IPD for domestic final demand is considered to be a better indicator of price change in the economy than the IPD for gross national expenditure as it excludes increase in stocks and the statistical discrepancy.

In general, annual movements in IPDs are more reliable indicators of "pure" price change than quarterly movements. However, care has to be taken in the interpretation of annual movements because such measures can disguise withinyear changes in trend (see "**Picking Turning Points in the Economy**" by Susan Linacre and John Zarb, **Australian Economic Indicators**, April 1991).

IPDs are subject to revision as a result of revisions in the current price or constant price estimates from which they are derived. Quarterly estimates as first published can be subject to revision as later data become available. The CPI is not revised.

NATIONAL ACCOUNTS-BASED WEIGHTED PRICE INDEXES(FWIs)

National accounts-based FWIs were developed to address the shortcoming that IPDs do not measure "pure" price change. FWIs were published for the first time in the December quarter 1988 issue of **Australian National Accounts: National Income and Expenditure** (5206.0).

FWIs relating to national accounts expenditure aggregates have been formed by applying fixed weights to the detailed price indexes used in deriving constant price estimates. The weights applied to each component index reflect the relative contribution of each individual expenditure item to the total expenditure aggregate in the base period (currently 1984/85). The resulting composite index forms a broader indicator of "pure" price change in the economy than any of the individual price

indexes from which it is composed.

A complication arises in the derivation of FWIs for exports of goods and services. Constant price estimates for some components are derived by quantity revaluation, and not by deflation using fixed weighted price indexes. Quantity revalued estimates are derived by multiplying the quantity of goods or services transacted in each period by a base year price. Since quantity revaluation is equivalent to the use of a currentweighted price index, the derived national accountsbased FWIs for total exports and imports of goods and services are not pure fixed weighted price indexes. However the impact of compositional change is minimised because the estimates are prepared at a fairly disaggregated (more homogeneous) level and then aggregated.

National accountsbased FWIs are published back to September quarter 1984 for each of the major components of gross domestic product, as well as for the aggregates **domestic final demand** and **gross domestic product**. Much more detailed FWIs are available on request.

THE CPI COMPARED WITH THE IPDs AND FWIs FOR NATIONAL ACCOUNTS AGGREGATES

The expenditure coverage of the CPI is broadly similar to **private final consumption expenditure**. IPDs and FWIs for expenditure aggregates such as **domestic final demand** and **GDP** provide a much broader measure of price change in the economy than the CPI. The broadest index relates to GDP. The relationships between the expenditure items and the major, aggregates are as follows:

Private Sinal consumption expenditure

+ Government final consumption expenditure

+ Private gross fixed capital expenditure

+ Public gross fixed capital expenditure

= Domestic final demand

+ Increase in stocks

+ Statistical discrepancy (balancing item)

= **Gross national expenditure (GNE)**

+ Exports of goods and services

Imports of goods and services

= **GDP**

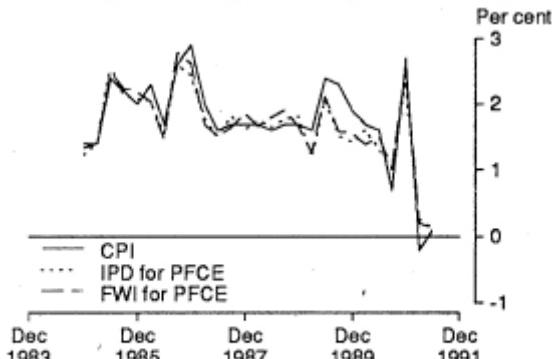
It should be noted that in practice, the volatile items **statistical discrepancy** and **increase in stocks**, are excluded from the calculation of the FWI for both GNE and GDP.

Private final consumption expenditure

The graph shows that movementsin the IPD and FWI for private final consumption expenditure are generally fairly close to movements in the CPI, although significant differences do occur in soms quarters. The broad similarity in movements is to be expected be cause most components

of private final consumption expenditure are deflated by components of the CPI.

Graph 1. CPI AND NATIONAL ACCOUNTS BASED PRICE INDEXES FOR PRIVATE FINAL CONSUMPTION EXPENDITURE
Percentage change from previous quarter



Source: ABS 5206.0; 6401.0

Tables 7.3 to 7.5 of **Australian Economic Indicators** show percentage changes for the CPI and the national accountsbased IPDs and FWIs. Since September quarter 1984 (the earliest available estimate for FWIs), the average difference in quarter on previous quarter movement between the CPI and both the IPD and FWI has been 0.2 percentage points. Average quarterly movements in the CPI over this period were 1.8 per cent. Differences from the CPI in individual quarters have been as high as 0.7 percentage points for the FWI and 0.9 percentage points for the IPD. For reasons explained below, a period of significant divergence occurred between March quarter 1989 and March quarter 1990.

There are some important reasons for the differences between the national accountsbased indexes for private final consumption expenditure and the CPI. The definition of private final consumption expenditure differs in some respects from household consumer expenditure as measured by the CPI. The inclusion of mortgage interest charges in the CPI from March quarter 1987 (they are excluded from private final consumption expenditure) has been a significant contributor to the divergence between the CPI and the national accountsbased indexes over the four quarters March 1989 to March 1990. Mortgage interest charges rose strongly over this period, affecting the CPI, but not the indexes for final consumption expenditure.

Another significant conceptual difference relates to the treatment of rent on dwellings. Private final consumption expenditure includes an imputed value for the rent that householders, as consumers, pay to themselves as owners of the dwellings they occupy. The CPI includes only actual rents paid by tenants. As can be seen from the table below, this results in a large difference in the weighting applied to rent in the CPI compared with that applied in the FWI for private final consumption expenditure.

Other significant differences relate to the treatment of hospital and medical services, motor vehicle insurance, government charges, and consumer debt interest.

Further, private final consumption expenditure is broader in scope, relating to expenditure by all Australian households, whereas the CPI excludes some significant population sub groups in the derivation of expenditure weights.

As previously mentioned, the IPD is current weighted whereas the CPI is fixed weighted. This is one explanation for the growth in the IPD being less than the growth in the CPI over time. The

substitution of goods and services whose prices have risen relatively slowly for goods and services whose prices have risen relatively quickly would be reflected in lower movements in the IPD, whereas the CPI, being fixed weighted, ignores these substitution effects.

Conceptual and coverage differences, together with the use of different base periods, result in different weights being used in the CPI and FWI when measuring similar components. Some examples are given below.

Table 1

Item	CPI weight (%)	FWI weight (%)
Food	19.0	15.8
Private motoring	16.1	10.2
Rent	4.5	17.2
Cigarettes and tobacco	2.2	1.9
Health and pharmaceuticals	3.8	6.7
Alcohol	6.0	4.9

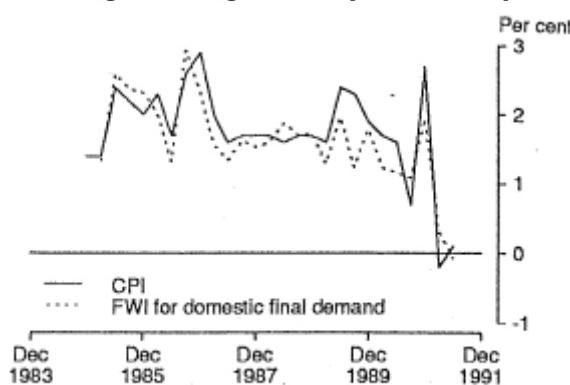
Source: Australian System of National Accounts: Concepts, Sources and Methods, ABS Cat. no. 5216.0

The average difference between the IPD and the FWI for private final consumption expenditure since September quarter 1984 has also been 0.2 percentage points.

Domestic final demand

The FWI for **domestic final demand tracks** the trends in the CPI reasonably closely, but grows more slowly over most of the period, particularly since March quarter 1989.

Graph 2. CPI AND FWI FOR DOMESTIC FINAL DEMAND
Percentage change from previous quarter



Source: ABS 5205.0; 6401.0

Two factors have been particularly significant in the latter period. First, the strong growth in mortgage interest charges over the four quarters March 1989 to March 1990 contributed to the stronger rise in the CPI and, second, the dramatic rise and subsequent fall in petrol prices resulting from the Gulf war was more accentuated in the CPI because of the higher weight given to this item in that index compared with the more broadly based indexes.

A factor which has acted to dampen growth in the FWI for domestic final demand over the past ten years or so has been the marked fall in the price index used to revalue computer equipment.

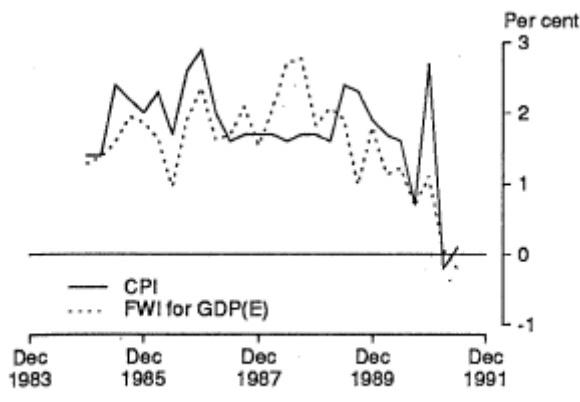
The **computer equipment price index** takes into account the enormous quality improvement in computing equipment, resulting in a large fall for that component of the national accounts-based price indexes (mainly affecting indexes for gross fixed capital expenditure, imports of goods and services and aggregates relating to final demand, but not GDP). Computer equipment is not included in the CPI basket of goods and services.

Since September quarter 1984, the average quarterly difference in price change between the FWI for domestic final demand and the CPI has been 0.3 percentage points, although individual differences have been as high as 1.1 percentage points. In annual terms to June quarter (compared with June quarter of the previous year), the change in the FWI for domestic final demand was lower than the CPI by 0.1 percentage points in 1990/91, 2.2 percentage points in 1989/90, and 0.8 percentage points in 1988/89. However, it should be noted that annual rates calculated in this way can be susceptible to significant change from quarter to quarter due to volatility in the series.

GDP(E)

The FWI for GDP(E) (GDP less the statistical discrepancy) shows a better rate of price increases than the CPI in the period before September quarter 1987 and since June quarter 1989. However it shows a much stronger rise in prices during most of the period from September quarter 1987 to March quarter 1989.

Graph 3. CPI AND FWI FOR GDP(E)
Percentage change from previous quarter



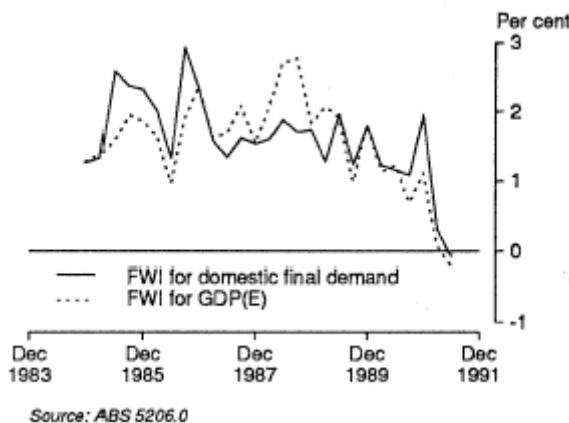
Source: ABS 5206.0; 6401.0

Apart from mortgage interest charges, a significant factor in the comparison is the movement in export and import prices. The FWI for GDP(E) measures price changes in domestically produced goods and services (i.e. it includes exports but excludes imports), whereas the CPI measures price changes in a basket of goods and services purchased by wage and salary earner households (including imported goods but excluding exports). Export and import prices can be quite volatile, with exchange rate changes having a significant effect at times. Export prices are also affected by cyclical swings in world commodity prices. In the June and September quarters 1988, there was a strong rise in prices for domestically produced goods and services, which was partially offset by a fall in import prices, the latter being reflected in the CPI, but not in the FWI for GDP(E).

Since September quarter 1984, the average difference in quarterly price changes has been 0.5 percentage points, but it has been above 1.0 percentage point on four occasions. In annual terms to June, the change in the FWI for GDP(E) was lower by 1.7 percentage points in 1990/91, 2.4 percentage points in 1989/90, and higher by 1.2 percentage points in 1988/89.

The difference between the FWIs for domestic final demand and GDP(E) is wholly explained by the inclusion of export prices in, and the exclusion of import prices from, the FWI for GDP(E).

Graph 4. FWI FOR DOMESTIC FINAL DEMAND AND GDP(E)
Percentage change from previous quarter



Source: ABS 5206.0

CONCLUSION

It is clear that the measure of general price change cannot be unique. A measure of price change is affected by the type of index chosen (fixed weighted or current weighted), the expenditure weights used, and the coverage of the index. Only fixed weighted indexes measure pure price change, although their validity as measures of inflation are dependent on the fixed weighting pattern being broadly representative of current period expenditures. Measures of price change can be used for many different purposes, including: macroeconomic analysis; measurement of changes in the cost of living; the removal of price effects from time series to reveal "real" changes; contract escalation; statutory increases in government benefits etc.; and the revaluation of fixed assets and stocks in current cost accounting. The measure of price change chosen should be the most appropriate available for the particular use at hand.

This page last updated 18 December 2009

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